

WHAT IS CLAIMED IS:

1. A light-emitting device comprising an insulating layer provided between an organic compound layer and an electrode positioned below the organic compound layer,

wherein the insulating layer allows a tunnel current or a Fowler-Nordheim current to flow therethrough to supply a current to the organic compound layer, and prevents moisture from diffusing to the organic compound layer,

wherein the insulating layer comprises at least one selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride, and has a thickness of 1 to 10 nm.

2. A light-emitting device comprising:

a first electrode formed on an insulating surface;

a first insulating layer covering an end portion of the first electrode and comprising a tapered edge;

a second insulating layer formed on the first electrode and the first insulating layer;

an organic compound layer formed on the second insulating layer; and

a second electrode formed on the organic compound layer,

wherein the first electrode and the organic compound layer are connected to each other through a tunnel junction.

3. A light-emitting device comprising:

a first electrode formed on an insulating surface;

a first insulating layer covering an end portion of the first electrode and comprising a tapered edge;

a second insulating layer formed on the first electrode and the first insulating layer;

an organic compound layer formed on the second insulating layer; and

a second electrode formed on the organic compound layer,

wherein the second insulating layer has a thickness that allows the first electrode and the organic compound layer to form a tunnel junction.

4. A light-emitting device comprising:

a first electrode formed on an insulating surface;

a first insulating layer covering an end portion of the first electrode and comprising a tapered edge;

a second insulating layer formed on the first electrode and the first insulating layer;

an organic compound layer formed on the second insulating layer; and

a second electrode formed on the organic compound layer,

wherein the second insulating layer has a thickness that allows the tunnel current or the Fowler-Nordheim current to flow therethrough.

5. A light-emitting device comprising:

a thin film transistor comprising a source region and a drain region;

an interlayer insulating film over the source region and the drain region;

a drain electrode connected to the drain region through an opening formed in the interlayer insulating film;

a first electrode formed on the interlayer insulating film so as to be connected to the drain electrode;

a first insulating layer comprising an opening on the first electrode, covering an end portion of the first electrode, and comprising a tapered edge;

a second insulating layer formed on the first electrode and the first insulating layer;

an organic compound layer formed on the second insulating layer; and

a second electrode formed on the organic compound layer,

wherein the first electrode and the organic compound layer are connected to each other through a tunnel junction.

6. A light-emitting device comprising:

a thin film transistor comprising a source region and a drain region;

an interlayer insulating film over the source region and the drain region;

a drain electrode connected to the drain region through an opening formed in the interlayer insulating film;

a first electrode formed on the interlayer insulating film so as to be connected to the drain electrode;

a first insulating layer comprising an opening on the first electrode, covering an end portion of the first electrode, and comprising a tapered edge;

a second insulating layer formed on the first electrode and the first insulating layer;

an organic compound layer formed on the second insulating layer; and
a second electrode formed on the organic compound layer,
wherein the second insulating layer has a thickness that allows the first electrode
and the organic compound layer to form a tunnel junction.

7. A light-emitting device comprising:

a thin film transistor comprising a source region and a drain region;
an interlayer insulating film over the source region and the drain region;
a drain electrode connected to the drain region through an opening formed in
the interlayer insulating film;
a first electrode formed on the interlayer insulating film so as to be connected
to the drain electrode;
a first insulating layer comprising an opening on the first electrode, covering an
end portion of the first electrode, and comprising a tapered edge;
a second insulating layer formed on the first electrode and the first insulating
layer;
an organic compound layer formed on the second insulating layer; and
a second electrode formed on the organic compound layer,
wherein the second insulating layer has a thickness that allows the tunnel current
or the Fowler-Nordheim current to flow therethrough.

8. A light-emitting device according to claim 2, wherein the second insulating layer
comprises at least one selected from the group consisting of silicon oxide, silicon nitride, and
silicon oxynitride.

9. A light-emitting device according to claim 3, wherein the second insulating layer comprises at least one selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride.

10. A light-emitting device according to claim 4, wherein the second insulating layer comprises at least one selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride.

11. A light-emitting device according to claim 5, wherein the second insulating layer comprises at least one selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride.

12. A light-emitting device according to claim 6, wherein the second insulating layer comprises at least one selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride.

13. A light-emitting device according to claim 7, wherein the second insulating layer comprises at least one selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride.

14. A light-emitting device according to claim 2, wherein the second insulating layer comprises carbon as a main component thereof.

15. A light-emitting device according to claim 3, wherein the second insulating layer comprises carbon as a main component thereof.

16. A light-emitting device according to claim 4, wherein the second insulating layer comprises carbon as a main component thereof.

17. A light-emitting device according to claim 5, wherein the second insulating layer comprises carbon as a main component thereof.

18. A light-emitting device according to claim 6, wherein the second insulating layer comprises carbon as a main component thereof.

19. A light-emitting device according to claim 7, wherein the second insulating layer comprises carbon as a main component thereof.

20. A light-emitting device according to claim 2, wherein the insulating surface comprises at least one of silicon nitride and silicon oxynitride.

21. A light-emitting device according to claim 3, wherein the insulating surface comprises at least one of silicon nitride and silicon oxynitride.

22. A light-emitting device according to claim 4, wherein the insulating surface comprises at least one of silicon nitride and silicon oxynitride.

23. A light-emitting device according to claim 5, wherein the insulating surface comprises at least one of silicon nitride and silicon oxynitride.

24. A light-emitting device according to claim 6, wherein the insulating surface comprises at least one of silicon nitride and silicon oxynitride.

25. A light-emitting device according to claim 7, wherein the insulating surface comprises at least one of silicon nitride and silicon oxynitride.

26. A light-emitting device according to claim 5, wherein the interlayer insulating film comprises a first layer comprising at least one of polyimide and acrylic resin and a second layer comprising at least one of silicon nitride, silicon oxynitride, carbon, and a densified film of the first layer.

27. A light-emitting device according to claim 6, wherein the interlayer insulating film comprises a first layer comprising at least one of polyimide and acrylic resin and a second layer comprising at least one of silicon nitride, silicon oxynitride, carbon, and a densified film of the first layer.

28. A light-emitting device according to claim 7, wherein the interlayer insulating film comprises a first layer comprising at least one of polyimide and acrylic resin and a second layer comprising at least one of silicon nitride, silicon oxynitride, carbon, and a densified film of the first layer.

29. A light-emitting device according to claim 2, wherein the first insulating layer comprises at least one of polyimide and acrylic resin.

30. A light-emitting device according to claim 3, wherein the first insulating layer comprises at least one of polyimide and acrylic resin.

31. A light-emitting device according to claim 4, wherein the first insulating layer comprises at least one of polyimide and acrylic resin.

32. A light-emitting device according to claim 5, wherein the first insulating layer comprises at least one of polyimide and acrylic resin.

33. A light-emitting device according to claim 6, wherein the first insulating layer comprises at least one of polyimide and acrylic resin.

34. A light-emitting device according to claim 7, wherein the first insulating layer comprises at least one of polyimide and acrylic resin.

35. A light-emitting device according to claim 2, wherein the second insulating layer has a thickness of 1 to 10nm.

36. A light-emitting device according to claim 3, wherein the second insulating layer has a thickness of 1 to 10nm.

37. A light-emitting device according to claim 4, wherein the second insulating layer has a thickness of 1 to 10nm.

38. A light-emitting device according to claim 5, wherein the second insulating layer has a thickness of 1 to 10nm.

39. A light-emitting device according to claim 6, wherein the second insulating layer has a thickness of 1 to 10nm.

40. A light-emitting device according to claim 7, wherein the second insulating layer has a thickness of 1 to 10nm.

41. A light-emitting device according to claim 2, wherein the insulating surface comprises at least one of silicon nitride and silicon oxynitride.

42. A light-emitting device according to claim 3, wherein the insulating surface comprises at least one of silicon nitride and silicon oxynitride.

43. A light-emitting device according to claim 4, wherein the insulating surface comprises at least one of silicon nitride and silicon oxynitride.

44. A light-emitting device according to claim 5, wherein the insulating surface comprises at least one of silicon nitride and silicon oxynitride.

45. A light-emitting device according to claim 6, wherein the insulating surface comprises at least one of silicon nitride and silicon oxynitride.

46. A light-emitting device according to claim 7, wherein the insulating surface comprises at least one of silicon nitride and silicon oxynitride.

47. A light-emitting device according to claim 2, wherein the light-emitting device is incorporated in one selected from the group consisting of a computer, a digital camera, a video camera, and a mobile phone.

48. A light-emitting device according to claim 3, wherein the light-emitting device is incorporated in one selected from the group consisting of a computer, a digital camera, a video camera, and a mobile phone.

49. A light-emitting device according to claim 4, wherein the light-emitting device is incorporated in one selected from the group consisting of a computer, a digital camera, a video camera, and a mobile phone.

50. A light-emitting device according to claim 5, wherein the light-emitting device is incorporated in one selected from the group consisting of a computer, a digital camera, a video camera, and a mobile phone.

51. A light-emitting device according to claim 6, wherein the light-emitting device is incorporated in one selected from the group consisting of a computer, a digital camera, a video camera, and a mobile phone.

52. A light-emitting device according to claim 7, wherein the light-emitting device is incorporated in one selected from the group consisting of a computer, a digital camera, a video camera, and a mobile phone.

53. A method of manufacturing a light-emitting apparatus, comprising the steps of:

- forming a first electrode on an insulating surface;
- forming a first insulating layer covering an end portion of the first electrode and comprising a tapered edge;
- forming a second insulating layer on the first electrode and the first insulating layer;
- forming an organic compound layer on the second insulating layer; and
- forming a second electrode on the organic compound layer,

wherein the first electrode and the organic compound layer are connected to each other through a tunnel junction.

54. A method of manufacturing a light-emitting apparatus, comprising the steps of:

- forming a first electrode on an insulating surface;
- forming a first insulating layer covering an end portion of the first electrode and comprising a tapered edge;

forming a second insulating layer on the first electrode and the first insulating layer;

forming an organic compound layer on the second insulating layer; and

forming a second electrode on the organic compound layer,

wherein the second insulating layer has a thickness that allows the first electrode and the organic compound layer to form a tunnel junction.

55. A method of manufacturing a light-emitting apparatus, comprising the steps of:

forming a first electrode on an insulating surface;

forming a first insulating layer covering an end portion of the first electrode and comprising a tapered edge;

forming a second insulating layer on the first electrode and the first insulating layer;

forming an organic compound layer on the second insulating layer; and

forming a second electrode on the organic compound layer,

wherein the second insulating layer has a thickness that allows the tunnel current or the Fowler-Nordheim current to flow therethrough.

56. A method of manufacturing a light-emitting device, comprising the steps of:

forming an interlayer insulating film over a source region and a drain region of a thin film transistor;

forming an opening reaching the drain region in the interlayer insulating film;

forming a drain electrode;

forming a first electrode connected to the drain electrode on the interlayer insulating film;

forming an insulating layer that covers the first electrode connected to the drain electrode;

forming an opening in the insulating layer on the first electrode to provide a first insulating layer;

forming a second insulating layer on the first electrode and the first insulating layer;

forming an organic compound layer on the second insulating layer; and

forming a second electrode on the organic compound layer,

wherein the first electrode and the organic compound layer are connected to each other through a tunnel junction.

57. A method of manufacturing a light-emitting device, comprising the steps of:

forming an interlayer insulating film over a source region and a drain region of a thin film transistor;

forming an opening reaching the drain region in the interlayer insulating film;

forming a drain electrode;

forming a first electrode connected to the drain electrode on the interlayer insulating film;

forming an insulating layer that covers the first electrode connected to the drain electrode;

forming an opening in the insulating layer on the first electrode to provide a first insulating layer;

forming a second insulating layer on the first electrode and the first insulating layer;

forming an organic compound layer on the second insulating layer; and

forming a second electrode on the organic compound layer,

wherein the second insulating layer has a thickness that allows the first electrode and the organic compound layer to form a tunnel junction.

58. A method of manufacturing a light-emitting device, comprising the steps of:

forming an interlayer insulating film over a source region and a drain region of a thin film transistor;

forming an opening reaching the drain region in the interlayer insulating film;

forming a drain electrode;

forming a first electrode connected to the drain electrode on the interlayer insulating film;

forming an insulating layer that covers the first electrode connected to the drain electrode;

forming an opening in the insulating layer on the first electrode to provide a first insulating layer;

forming a second insulating layer on the first electrode and the first insulating layer;

forming an organic compound layer on the second insulating layer; and

forming a second electrode on the organic compound layer,

wherein the second insulating layer has a thickness that allows the tunnel current or the Fowler-Nordheim current to flow therethrough.

59. A method of manufacturing a light-emitting device according to claim 53, wherein the second insulating layer comprises at least one selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride.

60. A method of manufacturing a light-emitting device according to claim 54, wherein the second insulating layer comprises at least one selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride.

61. A method of manufacturing a light-emitting device according to claim 55, wherein the second insulating layer comprises at least one selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride.

62. A method of manufacturing a light-emitting device according to claim 56, wherein the second insulating layer comprises at least one selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride.

63. A method of manufacturing a light-emitting device according to claim 57, wherein the second insulating layer comprises at least one selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride.

64. A method of manufacturing a light-emitting device according to claim 58, wherein the second insulating layer comprises at least one selected from the group consisting of silicon oxide, silicon nitride, and silicon oxynitride.

65. A method of manufacturing a light-emitting device according to claim 53, wherein the second insulating layer comprises carbon as a main component thereof.

66. A method of manufacturing a light-emitting device according to claim 54, wherein the second insulating layer comprises carbon as a main component thereof.

67. A method of manufacturing a light-emitting device according to claim 55, wherein the second insulating layer comprises carbon as a main component thereof.

68. A method of manufacturing a light-emitting device according to claim 56, wherein the second insulating layer comprises carbon as a main component thereof.

69. A method of manufacturing a light-emitting device according to claim 57, wherein the second insulating layer comprises carbon as a main component thereof.

70. A method of manufacturing a light-emitting device according to claim 58, wherein the second insulating layer comprises carbon as a main component thereof.

71. A method of manufacturing a light-emitting device according to claim 56, wherein the interlayer insulating film comprises at least one of polyimide and acrylic resin.

72. A method of manufacturing a light-emitting device according to claim 57, wherein the interlayer insulating film comprises at least one of polyimide and acrylic resin.

73. A method of manufacturing a light-emitting device according to claim 58, wherein the interlayer insulating film comprises at least one of polyimide and acrylic resin.

74. A method of manufacturing a light-emitting device according to claim 56, wherein the interlayer insulating film comprises a first layer comprising at least one of polyimide and acrylic resin and a second layer comprising at least one of silicon nitride, silicon oxynitride, carbon, and a densified film of the first layer.

75. A method of manufacturing a light-emitting device according to claim 57, wherein the interlayer insulating film comprises a first layer comprising at least one of polyimide and acrylic resin and a second layer comprising at least one of silicon nitride, silicon oxynitride, carbon, and a densified film of the first layer.

76. A method of manufacturing a light-emitting device according to claim 58, wherein the interlayer insulating film comprises a first layer comprising at least one of polyimide and acrylic resin and a second layer comprising at least one of silicon nitride, silicon oxynitride, carbon, and a densified film of the first layer.

77. A method of manufacturing a light-emitting device according to claim 53, wherein the first insulating layer comprises at least one of polyimide and acrylic resin, and a surface of the first insulating layer is modified by plasma treatment.

78. A method of manufacturing a light-emitting device according to claim 54, wherein the first insulating layer comprises at least one of polyimide and acrylic resin, and a surface of the first insulating layer is modified by plasma treatment.

79. A method of manufacturing a light-emitting device according to claim 55, wherein the first insulating layer comprises at least one of polyimide and acrylic resin, and a surface of the first insulating layer is modified by plasma treatment.

80. A method of manufacturing a light-emitting device according to claim 56, wherein the first insulating layer comprises at least one of polyimide and acrylic resin, and a surface of the first insulating layer is modified by plasma treatment.

81. A method of manufacturing a light-emitting device according to claim 57, wherein the first insulating layer comprises at least one of polyimide and acrylic resin, and a surface of the first insulating layer is modified by plasma treatment.

82. A method of manufacturing a light-emitting device according to claim 58, wherein the first insulating layer comprises at least one of polyimide and acrylic resin, and a surface of the first insulating layer is modified by plasma treatment.

83. A method of manufacturing a light-emitting device according to claim 53, wherein the second insulating layer has a thickness of 1 to 10nm.

84. A method of manufacturing a light-emitting device according to claim 54, wherein the second insulating layer has a thickness of 1 to 10nm.

85. A method of manufacturing a light-emitting device according to claim 55, wherein the second insulating layer has a thickness of 1 to 10nm.

86. A method of manufacturing a light-emitting device according to claim 56, wherein the second insulating layer has a thickness of 1 to 10nm.

87. A method of manufacturing a light-emitting device according to claim 57, wherein the second insulating layer has a thickness of 1 to 10nm.

88. A method of manufacturing a light-emitting device according to claim 58, wherein the second insulating layer has a thickness of 1 to 10nm.